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Pump-probe experiments with Ce3++Yb3+:KY 3F10 and Ce3++Yb3+:CaF2 crystals

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Abstract

Here we report on pump-probe studies of KY3F10 and CaF2 doped with Ce3+ and Yb3+ ions. The crystals Ce3+:KY3F10 and Ce3+: CaF2 show attractive spectral characteristics for tunable UV lasers application but have poor photochemical stability. Their properties under intense UV pumping are affected by excited state absorption and color centers formation. This work was aimed at dynamic processes investigation induced by laser radiation of UV spectral range in KY3F10 and CaF2 doped with Ce3+ and Yb3+ ions. Optical gain was observed on CaF2:Ce3++Yb3+ in the range 325-335 nm for the first time. It proves Yb3+ ions coactivation antisolarant effect elaborated by us earlier3. It is shown that in investigated crystals under a pump radiation, resonant to 4f-5d Ce3+ ions transitions several types of color centers (CC) are formed. Set of these CC types are determine the absorption at expected stimulated emission spectral range and magnitude of the induced loses is dependent on many factors. As a result of competition between CC formation, free charges recombination and CC photodestruction this balance can be shifted towards either rising or dropping losses at 5d-4f Ce3+ ions luminescence spectral range. © 2011 SPIE.

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Keywords

5d-4f transitions of Ce3+ ions, Optical gain, Phtotoinduced color centers